

U.S. Appln No. 10/720,005
Page 6

This listing of claims will replace all prior versions and listings of claims in the reissue application:

Listing of Claims:

1. (Currently amended) In a PEM fuel cell having at least one cell comprising a pair of opposite polarity electrodes, a membrane electrolyte [intedacent] interiacent said electrodes for conducting ions therebetween, and an electrically conductive contact element having a working face confronting at least one of said [electrodessfor] electrodes for conducting electrical current from said one electrode, the improvement comprising: said contact element comprising a corrosion-susceptible metal substrate and an electrically conductive, corrosion-resistant protective coating on said face to protect said substrate from the corrosive environment of said fuel cell, said protective coating comprising a mixture of electrically conductive particles dispersed throughout an oxidation-resistant and acid-resistant, water-insoluble polymeric matrix and having a resistivity no greater than about 50 ohm-cm, said mixture comprising graphite particles having a first particle size and other electrically conductive particles selected from the group consisting of gold, platinum, nickel, palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals and carbon, said other particles having a second particle size less than said first particle size to enhance the packing density of said particles.

U.S. Appln No. 10/720,005
Page 7

2. (Original) A fuel cell according to claim 1 wherein said carbon comprises carbon black.
3. (Original) A fuel cell according to claim 1 wherein said coating is electrophoretically deposited onto said substrate from a suspension of said particles in an aqueous solution of acid-solubilized polymer.
4. (Original) A fuel cell according to claim 1 wherein a discrete film of said coating is laminated onto said substrate to form said electrically conductive contact element.
5. (Original) A fuel cell according to claim 1 wherein a precursor of said coating is deposited onto said substrate from a solution thereof, dried and cured to form said coating.
6. (Original) A fuel cell according to claim 1 wherein said substrate comprises a first acid-soluble metal underlying a second acid-insoluble, passivating metal layer susceptible to oxidation in said environment.
7. (Original) A fuel cell according to claim 1 wherein said polymer matrix is selected from the group consisting of epoxies, silicones, polyamide-imides, polyether-imides, polyphenols, fluoro-elastomers, polyesters, phenoxy-phenolics, epoxide-phenolics, acrylics and urethanes.

U.S. Appln No. 10/720,005

Page 8

8. (Currently amended) In a PEM fuel cell having at least one cell comprising a pair of opposite polarity electrodes, a membrane electrolyte [intedjacent] interjacent said electrodes for conducting ions therebetween, and an electrically conductive contact element having a working face confronting at least one of said electrodes for conducting electrical current from said one electrode, the improvement comprising: said contact element comprising a corrosion-susceptible metal substrate and an electrically conductive, corrosion-resistant protective coating on said face to protect said substrate from the corrosive environment of said fuel cell, said protective coating comprising a plurality of electrically conductive particles dispersed throughout an oxidation-resistant and acid-resistant, water-insoluble polymeric matrix and having a resistivity no greater than about 50 ohm-cm, said substrate comprising a first acid-soluble metal underlying a second acid-insoluble, passivating layer susceptible to oxidation in said environment.

9.(New) A product comprising:

a fuel cell comprising a bipolar plate and an electrically conductive corrosion-resistant protective coating over the bipolar plate, the coating comprising a water-insoluble polymer and a plurality of first electrically conductive particles, and a plurality of second electrically conductive particles, the first particles being larger than the second particles, the first particles

U.S. Appln No. 10/720,005
Page 9

forming interstices therebetween and the at least a portion of the second particle filling the interstices.

10.(New) A product as set forth in claim 9 wherein the bipolar plate comprises a first layer and a second layer over the first layer, and wherein the coating is over the second layer, and the second layer comprises at least one selected from the following: a physical vapor deposited metal, a chemical vapor deposited metal or metal clad material.

11.(New) A product as set forth in claim 9 wherein the bipolar plate comprises a first layer comprising a metal.

12.(New) A product as set forth in claim 9 wherein the bipolar plate comprises a first layer comprising aluminum.

13. (New) A product as set forth in claim 9 wherein the bipolar plate comprises a first layer comprising stainless steel.

14. (New) A product as set forth in claim 9 wherein the bipolar plate comprises a first layer comprising titanium.

U.S. Appln No. 10/720,005

Page 10

15. (New) A product as set forth in claim 9 wherein the bipolar plate comprises a first layer comprising a corrosion- susceptible metal.

16. (New) A product as set forth in claim 9 wherein the bipolar plate comprises a first layer comprising a metal susceptible to oxidation.

17. (New) A product as set forth in claim 9 wherein the bipolar plate comprises a barrier having a passivating oxide film formed thereon.

18. (New) A product as set forth in claim 9 wherein the bipolar plate comprises a first layer comprising a corrosion- susceptible metal, and wherein the substrate further comprises a second layer over the first layer, the second layer comprising a metal having a passivating oxide film formed thereon.

19. (New) A product as set forth in claim 9 wherein the bipolar plate comprises a first layer comprising a corrosion- susceptible metal, and wherein the substrate further comprises a second layer over the first layer.

20. (New) A product as set forth in claim 9 wherein the coating has a thickness ranging from about 15 to about 25 microns.

U.S. Appln No. 10/720,005
Page 11

21. (New) A product as set forth in claim 9 wherein the first particles have a size ranging from about 5-20 microns.

22. (New) A product as set forth in claim 9 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

23. (New) A product as set forth in claim 9 wherein the first particles comprise graphite.

24. (New) A product as set forth in claim 9 wherein the second particles comprise carbon black.

25. (New) A product as set forth in claim 9 wherein the first particles comprise graphite and the second particle comprise carbon black.

26. (New) A product as set forth in claim 25 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

U.S. Appln No. 10/720,005
Page 12

27. (New) A product as set forth in claim 9 wherein the second particles comprise at least one selected from the following: gold, platinum, nickel, palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals, carbon, carbon black or mixtures thereof.

28. (New) A product as set forth in claim 9 wherein the coating has a thickness ranging from about 5 to about 75 microns.

29. (New) A product as set forth in claim 9 wherein the coating has a thickness ranging from about 15 to about 25 microns.

30. (New) A product as set forth in claim 9 wherein the first particles have a size ranging from about 5-20 microns.

31. (New) A product as set forth in claim 9 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

32. (New) A product as set forth in claim 9 wherein the first particles comprise graphite.

U.S. Appln No. 10/720,005

Page 13

33. (New) A product as set forth in claim 9 wherein the second particles comprise carbon.

34. (New) A product as set forth in claim 9 wherein the second particles comprise carbon black.

35. (New) A product as set forth in claim 9 wherein the first particles comprise graphite and the second particle comprise carbon black.

36. (New) A product as set forth in claim 35 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

37. (New) A product as set forth in claim 9 wherein the second particles comprise at least one selected from the following: gold, platinum, nickel, palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals, carbon, carbon black or mixtures thereof.

38. (New) A product as set forth in claim 37 wherein the second particle have a size less than the first particles to enhance the packing density of the particles.

U.S. Appln No. 10/720,005
Page 14

39. (New) A product as set forth in claim 9 the polymer comprises at least one selected from the following: an epoxy, silicone, polyamide-imide, polyether-imide, plovphenol, fluoro-elastomer, polyester, phenoxy-phenolic, epoxide-phenolic, acrylic, urethane or mixtures thereof.

40. (New) A product comprising:
an electrically conductive contact element for a fuel cell and an electrically conductive corrosion-resistant protective coating over the contact element, the coating comprising a water-insoluble polymer and a plurality of first electrically conductive particles, and a plurality of second electrically conductive particles, the first particles being larger than second particles and filling, the first particles form interstices therebetween and at least a portion of the second particle filling the interstices.

41. (New) A product as set forth in claim 40 wherein the contact element comprises a first layer and a second layer over the first layer, and wherein the coating is over the second layer, and the second layer comprises at least one of a physical vapor deposited metal, a chemical vapor deposited metal and metal clad material.

42. (New) A product as set forth in claim 40 wherein the contact element comprises a first layer comprising a metal.

U.S. Appln No. 10/720,005
Page 15

43. (New) A product as set forth in claim 40 wherein the contact element comprises a first layer comprising a corrosion- susceptible metal, and wherein the substrate further comprises a second layer over the first layer, the second layer comprising a metal having a passivating oxide film formed thereon.

44. (New) A product as set forth in claim 43 wherein the first layer comprises aluminum, and the second layer comprises at least one of stainless steel and titanium.

45. (New) A product comprising:
a fuel cell comprising an electrically conductive contact element and an electrically conductive corrosion-resistant protective coating over the contact element, the coating comprising a water-insoluble polymer and a plurality of first electrically conductive particles comprising graphite, and a plurality of second electrically conductive particles, the first particles being larger than second particles and filling, the first particles forming interstices therebetween and at least a portion of the second particle filling the interstices.

46. (New) A product as set forth in claim 45 wherein the contact element comprises a first layer comprising a metal.

47. (New) A product as set forth in claim 45 wherein the contact element comprises a first layer comprising aluminum.

U.S. Appln No. 10/720,005
Page 16

48. (New) A product as set forth in claim 45 wherein the contact element comprises a first layer comprising stainless steel.

49. (New) A product as set forth in claim 45 wherein the contact element comprises a first layer comprising titanium.

50. (New) A product as set forth in claim 45 wherein the contact element comprises a first layer comprising a corrosion- susceptible metal.

51. (New) A product as set forth in claim 45 wherein the contact element comprises a first layer comprising a metal susceptible to oxidation.

52. (New) A product as set forth in claim 45 wherein the contact element comprises a barrier having a passivating oxide film formed thereon.

53. (New) A product as set forth in claim 45 wherein the contact element comprises a first layer comprising a corrosion- susceptible metal, and wherein the substrate further comprises a second layer over the first layer, the second layer comprising a metal having a passivating oxide film formed thereon.

U.S. Appln No. 10/720,005

Page 17

54. (New) A product as set forth in claim 45 wherein the coating has a thickness ranging from about 5 to about 75 microns.

55. (New) A product as set forth in claim 45 wherein the coating has a thickness ranging from about 15 to about 25 microns.

56. (New) A product as set forth in claim 45 wherein the first particles have a size ranging from about 5-20 microns.

57. (New) A product as set forth in claim 45 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

58. (New) A product as set forth in claim 45 wherein the bipolar plate comprises a first layer and a second layer over the first layer, and wherein the coating is over the second layer, and the second layer comprises at least one selected from the following: a physical vapor deposited metal, a chemical vapor deposited metal or metal clad material.

59. (New) A product as set forth in claim 45 wherein the second particles comprise carbon.

U.S. Appln No. 10/720,005
Page 18

60. (New) A product as set forth in claim 45 wherein the second particles comprise carbon black.

61. (New) A product as set forth in claim 45 wherein the first particles comprise graphite and the second particle comprise carbon black.

62. (New) A product as set forth in claim 61 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

63. (New) A product as set forth in claim 45 wherein the second particles comprise at least one selected from the following: gold, platinum, nickel, palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals, carbon, carbon black or mixtures thereof.

64. (New) A product as set forth in claim 45 the polymer comprises at least one selected from the following an epoxy, silicone, polyamide-imide, polyether-imide, ployphenol, fluoro-elastomer, polyester, phnoxy-phenolic, epoxide-phenolic, acrylic, urethane or mixtures thereof.

65. (New) A product comprising:

U.S. Appln No. 10/720,005
Page 19

a fuel cell comprising an electrically conductive contact element and an electrically conductive corrosion-resistant protective coating over the contact element, the coating comprising a water-insoluble corrosion-resistant polymer and a plurality of first electrically conductive particles, the contact element comprising a first layer comprising a corrosion-susceptible metal and a second layer comprising a metal over the first layer, and wherein the coating overlies the second layer.

66. (New) A product as set forth in claim 65 wherein the electrically conductive contact element comprises a bipolar plate.

67. (New) A product as set forth in claim 65 further comprising a plurality of second electrically conductive particles, the first particles being larger than the second particles, the first particles forming interstices therebetween and the at least a portion of the second particle filling the interstices.

68. (New) A product as set forth in claim 67 wherein the first particles comprise graphite.

69. (New) A product as set forth in claim 67 wherein the second particles comprise carbon black.

U.S. Appln No. 10/720,005

Page 20

70. (New) A product as set forth in claim 67 wherein the first particles comprise graphite and the second particles comprise carbon black.

71. (New) A product as set forth in claim 70 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

72. (New) A product as set forth in claim 67 wherein the second particles comprise at least one selected from the following: gold, platinum, nickel, palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals, carbon, carbon black or mixture thereof.

73. (New) A product as set forth in claim 65 wherein the second layer comprises a metal clad.

74. (New) A product as set forth in claim 65 wherein the second layer comprises a physical vapor deposited metal.

75. (New) A product as set forth in claim 74 wherein the physical vapor deposited metal comprises titanium.

U.S. Appln No. 10/720,005

Page 21

76. (New) A product as set forth in claim 74 wherein the physical vapor deposited metal comprises stainless steel.

77. (New) A product as set forth in claim 65 wherein the second layer comprises a chemical vapor deposited metal.

78. (New) A product as set forth in claim 9 wherein the bipolar plate comprises a first exterior sheet and a second exterior sheet, and wherein each of the first exterior sheet and second exterior sheet includes an underside including a plurality channels to permit coolant to flow through the bipolar plate.

79. (New) A product as set forth in claim 45 wherein the contact element comprises a first layer and a second layer over the first layer, and wherein the coating is over the second layer, and the second layer comprises at least one of a physical vapor deposited metal, a chemical vapor deposited metal and metal clad material.

80. (New) A PEM fuel cell comprising:
at least one cell comprising a pair of opposite polarity electrodes, a membrane electrolyte adjacent each of said electrodes for conducting ions therebetween, and an electrically conductive contact element having a working face confronting at least one of said electrodes for conducting electrical current from said one electrode, said contact element comprising a corrosion-

U.S. Appln No. 10/720,005
Page 22

susceptible metal substrate and an electrically conductive, corrosion-resistant protective coating on said face to protect said substrate from the corrosive environment of said fuel cell, said protective coating comprising a mixture of electrically conductive particles dispersed throughout an oxidation-resistant and acid-resistant, water-insoluble polymeric matrix, said mixture comprising graphite particles having a first particle size and other electrically conductive particles comprising at least one selected from the following: gold, platinum, nickel, palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium- alloyed titanium, nickel-alloyed titanium, rare earth metals and carbon, or mixtures thereof; said other particles having a second particle size less than said first particle size to enhance the packing density of said particles.

81.(New) A product comprising:

a fuel cell comprising an electrical conductive contact element and an electrically conductive corrosion-resistant protective coating over the contact element, the coating comprising a water-insoluble polymer comprising at least one selected from the following: epoxy, silicone, polyamide-imide, polyether-imide, ployphenol, fluoro-elastomer, polyester, phnoxy-phenolic, epoxide-phenolic, acrylic, urethane or mixtures thereof; and a plurality of first electrically conductive particles.

82. (New) A product as set forth in claim 81 wherein the first electrically conductive particle comprises graphite.

U.S. Appln No. 10/720,005
Page 23

83. (New) A product as set forth in claim 81 further comprising a plurality of second electrically conductive particles, the first particles being larger than the second particles, the first particles forming interstices therebetween and the at least a portion of the second particle filling the interstices.

84. (New) A product as set forth in claim 83 wherein the second electrically conductive particles comprise at least one selected from the following: gold, platinum, nickel, palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals, carbon, carbon black or mixtures thereof.

85. (New) A product as set forth in claim 83 wherein the first electrically conductive particles comprise graphite and the second electrically conductive particles comprise carbon black.

86. (New) A process comprising:
applying an electrically conductive corrosion-resistant protective coating over the bipolar plate for a fuel cell, the coating comprising a water-insoluble polymer and a plurality of first electrically conductive particles, and a plurality of second electrically conductive particles, the

U.S. Appln No. 10/720,005
Page 24

first particles being larger than the second particles, the first particles forming interstices therebetween and the at least a portion of the second particle filling the interstices.

87.(New) A process as set forth in claim 86 wherein the bipolar plate comprises a first layer and a second layer over the first layer, and wherein the coating is over the second layer, and the second layer comprises at least one selected from the following: a physical vapor deposited metal, a chemical vapor deposited metal or metal clad material.

88.(New) A process as set forth in claim 86 wherein the bipolar plate comprises a first layer comprising a metal.

89. (New) A process as set forth in claim 86 wherein the bipolar plate comprises a first layer comprising aluminum.

90. (New) A process as set forth in claim 86 wherein the bipolar plate comprises a first layer comprising stainless steel.

91. (New) A process as set forth in claim 86 wherein the bipolar plate comprises a first layer comprising titanium.

U.S. Appln No. 10/720,005
Page 25

92. (New) A process as set forth in claim 86 wherein the bipolar plate comprises a first layer comprising a corrosion- susceptible metal.

93. (New) A process as set forth in claim 86 wherein the bipolar plate comprises a first layer comprising a metal susceptible to oxidation.

94. (New) A process as set forth in claim 86 wherein the bipolar plate comprises a barrier having a passivating oxide film formed thereon.

95. (New) A process as set forth in claim 86 wherein the bipolar plate comprises a first layer comprising a corrosion- susceptible metal, and wherein the substrate further comprises a second layer over the first layer, the second layer comprising a metal having a passivating oxide film formed thereon.

96. (New) A process as set forth in claim 86 wherein the coating has a thickness ranging from about 15 to about 25 microns.

97. (New) A process as set forth in claim 86 wherein the first particles have a size ranging from about 5-20 microns.

U.S. Appln No. 10/720,005

Page 26

98. (New) A process as set forth in claim 86 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

99. (New) A process as set forth in claim 86 wherein the first particles comprise graphite.

100. (New) A process as set forth in claim 86 wherein the second particles comprise carbon black.

101. (New) A process as set forth in claim 86 wherein the first particles comprise graphite and the second particle comprise carbon black.

102. (New) A process as set forth in claim 101 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

103. (New) A process as set forth in claim 86 wherein the second particles comprise at least one selected from the following: gold, platinum, nickel, palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals, carbon, carbon black or mixtures thereof.

U.S. Appln No. 10/720,005
Page 27

104. (New) A product as set forth in claim 86 wherein the coating has a thickness ranging from about 5 to about 75 microns.

105. (New) A process as set forth in claim 86 wherein the coating has a thickness ranging from about 15 to about 25 microns.

106. (New) A process as set forth in claim 86 wherein the first particles have a size ranging from about 5-20 microns.

107. (New) A process as set forth in claim 86 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

108. (New) A process as set forth in claim 86 wherein the first particles comprise graphite.

109. (New) A process as set forth in claim 86 wherein the second particles comprise carbon.

110. (New) A process as set forth in claim 86 wherein the second particles comprise carbon black.

U.S. Appln No. 10/720,005

Page 28

111. (New) A process as set forth in claim 86 wherein the first particles comprise graphite and the second particle comprise carbon black.

112. (New) A process as set forth in claim 111 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

113. (New) A process as set forth in claim 86 wherein the second particles comprise at least one selected from the following: gold, platinum, nickel, palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals, carbon, carbon black or mixtures thereof.

114. (New) A process as set forth in claim 113 wherein the second particle have a size less than the first particles to enhance the packing density of the particles.

115. (New) A process as set forth in claim 86 the polymer comprises at least one selected from the following: an epoxy, silicone, polyamide-imide, polyether-imide, ployphenol, fluoro-elastomer, polyester, phnoxy-phenolic, epoxide-phenolic, acrylic, urethane or mixtures thereof.

U.S. Appln No. 10/720,005
Page 29

116. (New) A process as set forth in claim 86 wherein the applying an electrically conductive corrosion-resistant protective coating comprises laminating a preformed discrete film of a coating material onto the bipolar plate.

117. (New) A process as set forth in claim 86 wherein the applying an electrically conductive corrosion-resistant protective coating comprises applying a precursor layer of a coating material to the bipolar plate followed by drying and curing the coating material.

118. (New) A process as set forth in claim 86 wherein the coating material comprises a slurry comprising said particles and a solvated polymer.

119. (New) A process as set forth in claim 86 wherein the applying an electrically conductive corrosion-resistant protective coating comprises electrophoretically depositing a coating material onto the bipolar plate.

120. (New) A process comprising:
applying an electrically conductive corrosion-resistant protective coating over an electrically conductive contact element for a fuel cell, the coating comprising a water-insoluble polymer and a plurality of first electrically conductive particles, and a plurality of second electrically conductive particles, the first particles being larger than second particles and filling.

U.S. Appln No. 10/720,005
Page 30

the first particles forming interstices therebetween and at least a portion of the second particle filling the interstices, and forming a fuel cell with the electrically conductive corrosion-resistant protective coated electrically conductive contact element.

121.(New) A process as set forth in claim 120 wherein the contact element comprises a first layer and a second layer over the first layer, and wherein the coating is over the second layer, and the second layer comprises at least one of a physical vapor deposited metal, a chemical vapor deposited metal and metal clad material.

122. (New) A process as set forth in claim 120 wherein the contact element comprises a first layer comprising a metal.

123. (New) A process as set forth in claim 120 wherein the contact element comprises a first layer comprising a corrosion- susceptible metal, and wherein the substrate further comprises a second layer over the first layer, the second layer comprising a metal having a passivating oxide film formed thereon.

124. (New) A process as set forth in claim 123 wherein the first layer comprises aluminum, and the second layer comprises at least one of stainless steel and titanium.

125. (New) A process comprising:

U.S. Appln No. 10/720,005

Page 31

applying an electrically conductive corrosion-resistant protective coating over an electrically conductive contact element, the coating comprising a water-insoluble polymer and a plurality of first electrically conductive particles comprising graphite, and a plurality of second electrically conductive particles, the first particles being larger than second particles and filling, the first particles forming interstices therebetween and at least a portion of the second particle filling the interstices.

126. (New) A process as set forth in claim 125 wherein the contact element comprises a first layer comprising a metal.

127. (New) A process as set forth in claim 125 wherein the contact element comprises a first layer comprising aluminum.

128. (New) A process as set forth in claim 125 wherein the contact element comprises a first layer comprising stainless steel.

129. (New) A process as set forth in claim 125 wherein the contact element comprises a first layer comprising titanium.

130. (New) A process as set forth in claim 125 wherein the contact element comprises a first layer comprising a corrosion- susceptible metal.

U.S. Appln No. 10/720,005

Page 32

131. (New) A process as set forth in claim 125 wherein the contact element comprises a first layer comprising a metal susceptible to oxidation.

132. (New) A process as set forth in claim 125 wherein the contact element comprises a barrier having a passivating oxide film formed thereon.

133. (New) A process as set forth in claim 125 wherein the contact element comprises a first layer comprising a corrosion- susceptible metal, and wherein the substrate further comprises a second layer over the first layer, the second layer comprising a metal having a passivating oxide film formed thereon.

134. (New) A process as set forth in claim 125 wherein the coating has a thickness ranging from about 5 to about 75 microns.

135. (New) A process as set forth in claim 125 wherein the coating has a thickness ranging from about 15 to about 25 microns.

136. (New) A process as set forth in claim 125 wherein the first particles have a size ranging from about 5-20 microns.

U.S. Appln No. 10/720,005
Page 33

137. (New) A process as set forth in claim 125 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

138. (New) A process as set forth in claim 125 wherein the bipolar plate comprises a first layer and a second layer over the first layer, and wherein the coating is over the second layer, and the second layer comprises at least one selected from the following: a physical vapor deposited metal, a chemical vapor deposited metal or metal clad material.

139. (New) A process as set forth in claim 125 wherein the second particles comprise carbon.

140. (New) A process as set forth in claim 125 wherein the second particles comprise carbon black.

141. (New) A process as set forth in claim 125 wherein the first particles comprise graphite and the second particle comprise carbon black.

142. (New) A process as set forth in claim 141 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

U.S. Appln No. 10/720,005

Page 34

143. (New) A process as set forth in claim 125 wherein the second particles comprise at least one selected from the following: gold, platinum, nickel, palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals, carbon, carbon black or mixtures thereof.

144. (New) A process as set forth in claim 125 the polymer comprises at least one selected from the following an epoxy, silicone, polyamide-imide, polyether-imide, polyphenol, fluoro-elastomer, polyester, phenoxy-phenolic, epoxide-phenolic, acrylic, urethane or mixtures thereof.

145. (New) A process comprising:
providing a contact element for a fuel cell comprising a first layer comprising a corrosion-susceptible metal and a second layer comprising a metal over the first layer, and
applying an electrically conductive corrosion-resistant protective coating over the second layer,
and wherein the coating comprising a water-insoluble corrosion-resistant polymer and a plurality of first electrically conductive particles.

146. (New) A process as set forth in claim 145 wherein the electrically conductive contact element comprises a bipolar plate.

U.S. Appln No. 10/720,005
Page 35

147. (New) A process as set forth in claim 145 further comprising a plurality of second electrically conductive particles, the first particles being larger than the second particles, the first particles forming interstices therebetween and the at least a portion of the second particle filling the interstices.

148. (New) A process as set forth in claim 147 wherein the first particles comprise graphite.

149. (New) A process as set forth in claim 147 wherein the second particles comprise carbon black.

150. (New) A process as set forth in claim 147 wherein the first particles comprise graphite and the second particles comprise carbon black.

151. (New) A process as set forth in claim 150 wherein the first particles have a size ranging from about 5-20 microns and the second particles have a size ranging from about 0.5-1.5 microns.

152. (New) A process as set forth in claim 147 wherein the second particles comprise at least one selected from the following: gold, platinum, nickel, palladium, rhodium, niobium,

U.S. Appln No. 10/720,005

Page 36

titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals, carbon, carbon black or mixture thereof.

153. (New) A process as set forth in claim 145 wherein the second layer comprises a metal clad.

154. (New) A process as set forth in claim 145 wherein the second layer comprises a physical vapor deposited metal.

155. (New) A process as set forth in claim 154 wherein the physical vapor deposited metal comprises titanium.

156. (New) A process as set forth in claim 154 wherein the physical vapor deposited metal comprises stainless steel.

157. (New) A process as set forth in claim 145 wherein the second layer comprises a chemical vapor deposited metal.

158. (New) A process as set forth in claim 145 wherein the contact element comprises a bipolar plate comprises a first exterior sheet and a second exterior sheet, and wherein each of

U.S. Appln No. 10/720,005

Page 37

the first exterior sheet and second exterior sheet includes an underside including a plurality channels to permit coolant to flow through the bipolar plate.

159. (New) A process as set forth in claim 145 wherein the contact element comprises a first layer and a second layer over the first layer, and wherein the coating is over the second layer, and the second layer comprises at least one of a physical vapor deposited metal, a chemical vapor deposited metal and metal clad material.

160. (New) A process as set forth in claim 145 wherein the applying an electrically conductive corrosion-resistant protective coating comprises laminating a preformed discrete film of a coating material onto the bipolar plate.

161. (New) A process as set forth in claim 145 wherein the applying an electrically conductive corrosion-resistant protective coating comprises applying a precursor layer of a coating material to the bipolar plate followed by drying and curing the coating material.

162. (New) A process as set forth in claim 145 wherein the coating material comprises a slurry comprising said particles and a solvated polymer.

U.S. Appln No. 10/720,005
Page 38

163. (New) A process as set forth in claim 145 wherein the applying an electrically conductive corrosion-resistant protective coating comprises electrophoretically depositing a coating material onto the bipolar plate.

164. (New) A process comprising:
applying an electrically conductive corrosion-resistant protective coating over the contact element for a fuel cell, the coating comprising a water-insoluble polymer comprising at least one selected from the following: epoxy, silicone, polyamide-imide, polyether-imide, polyphenol, fluoro-elastomer, polyester, phenoxy-phenolic, epoxide-phenolic, acrylic, urethane or mixtures thereof; and a plurality of first electrically conductive particles.

165. (New) A process as set forth in claim 164 wherein the first electrically conductive particle comprises graphite.

166. (New) A process as set forth in claim 165 further comprising a plurality of second electrically conductive particles, the first particles being larger than the second particles, the first particles forming interstices therebetween and the at least a portion of the second particle filling the interstices.

167. (New) A process as set forth in claim 166 wherein the second electrically conductive particles comprise at least one selected from the following: gold, platinum, nickel,

U.S. Appln No. 10/720,005

Page 39

palladium, rhodium, niobium, titanium carbide, titanium nitride, titanium diboride, chromium-alloyed titanium, nickel-alloyed titanium, rare earth metals, carbon, carbon black or mixtures thereof.

168. (New) A process as set forth in claim 164 wherein the first electrically conductive particles comprise graphite and the second electrically conductive particles comprise carbon black.

169. (New) A process as set forth in claim 164 wherein the applying an electrically conductive corrosion-resistant protective coating comprises laminating a preformed discrete film of a coating material onto the bipolar plate.

170. (New) A process as set forth in claim 164 wherein the applying an electrically conductive corrosion-resistant protective coating comprises applying a precursor layer of a coating material to the bipolar plate followed by drying and curing the coating material.

171. (New) A process as set forth in claim 164 wherein the coating material comprises a slurry comprising said particles and a solvated polymer.

U.S. Appln No. 10/720,005

Page 40

172. (New) A process as set forth in claim 164 wherein the applying an electrically
conductive corrosion-resistant protective coating comprises electrophoretically depositing a
coating material onto the bipolar plate.